

Arctic-Atlantic connections for sea ice, ocean and biogeochemistry in the UK Earth System Model (UK ESM1)

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Analysis of Arctic sea ice and ocean dynamics in the ensemble of the UK Earth System Model (UK ESM1) simulations has completed under the Coupled Model Inter-comparison Project Phase 6 (CMIP6) protocol. The focus of the investigation is on the future changes in the Arctic sea ice and oceanic connections and on the impact of the nutrient advection on the Arctic marine biogeochemistry and ecosystems. Changes in the balance of the oceanic inflows from the North Atlantic and North Pacific Oceans are found to have a first order effect on the watermasses and nutrients balances in the central Arctic Ocean. The simulations show that the total primary production in the Arctic Ocean is increased by 100% in the 2090s as compared to the present climate. This is caused by higher nutrients availability in the Atlantic inflowing waters and prolonged ice-free season. The faster connections through the Arctic and milder oceanic environment allows species to survive through the winter and from the second half of the century the Arctic Ocean could become a key oceanic gateway connecting the global oceans. The study is supported from the project APEAR (NE/R012865/1) NERC-BMBF and from the NERC ACSIS Programme (NE/N018044/1).